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PROFESSOR OSTWALD'S PHILOSOPHY.

AN APPRECIATION AND A CRITICISM.

SCIENCE and philosophy are inseparables, for science rests on certain presuppositions the comprehension of which belongs to the domain of philosophy. Yet it sometimes seems as if a deep gulf existed between the two; for according to the law of a division of labor, scientists as a rule plod on in their various lines of research without troubling themselves about the principles that underlie their investigations, arguments, and conclusions, while most philosophers live in their abstractions, moralizing and theorizing in utter unconcern about the facts of physics chemistry, biology, or what not. Some men, however, have risen from the ranks of the scientists who ventured to go deeper to find the bottom rock of science, foremost among whom stands Ernst Mach, who has opened new vistas and pointed out the way to a philosophical pursuance of scientific work, and among his successors none is better and more widely known than his brilliant disciple, Professor Wilhelm Ostwald. Having started as a scientist, he has become more and more a philosopher, and we learn that he has now surrendered his chair of physical chemistry at Leipsic to devote himself exclusively to philosophical work which has grown increasingly dearer to him; but he seems to be disappointed that his colleagues do not follow his lead and are slow in adopting his philosophy. He says (on pages 483-484 of this issue):

"Except in periods of unusual philosophical activity the specialist in science troubles himself but little with the elements of the universal or philosophical conceptions which he employs for the purpose of classifying his several data; and this is because they apparently do not essentially enter into the consideration of the latter. So specialized science is not only slow to adopt the corresponding thought-formations of contemporary philosophy, but even thinks little of changing them again forthwith to correspond to the modifications of philosophical conceptions. Therefore it remains as far behind philosophy as philosophy commonly remains behind science, whence arises a twofold delay in the philosophical components of the special sciences, which of course does not appear in technical treatises but in the introductions to text-books. . . . These remarkable conditions must be borne in mind if one would judge correctly the position of energetics in the science and philosophy of to-day."

With Professor Ostwald we believe that philosophy is indispensable to science; but at the same time it is our opinion that scientists ought to move slowly and think twice before they introduce a new and untried philosophy into text-books, or even the introductions to text-books. Their conservatism may indeed be a vice if, as Ostwald suggests, it is due to inertia and indifference, but slowness is better than rashness, and it is preferable to avoid innovations which after a second sober thought would have to be abandoned.

Since Professor Ostwald has grown into prominence, having many friends and admirers both in the old and the new world, we will here investigate his claim to recognition and trust that a discussion of his philosophy will be welcome to our readers.

Professor Ostwald has set forth his philosophical views in his *Vorlesungen über Naturphilosophie*, a voluminous work of extraordinary erudition, and has recently restated them in a terse recapitulation of the leading principles in an essay entitled "Zur modernen Energetik," which has just appeared in the *Rivista di Scienza*, a new philosophical

magazine ably conducted by a committee of directors with the editorial management of Dr. Giuseppe Jona of Milan, and published at Bologna by Nicola Zanichelli. In order to offer to our readers an authoritative presentation of Professor Ostwald's views we publish with the author's kind permission an English translation of this essay which is incorporated in the present number of *The Monist*, and in our discussion we will most frequently refer to this, the most recent statement of his views.

* * *

The salient point of Professor Ostwald's philosophy is the idea that the only reality of the world is energy, hence its name *Energetik*, or as we would say in English, "energetics." Ostwald follows the monistic tendency of the age to reduce all explanations to one supreme principle, and he finds this to be energy, not (as others have claimed) matter. Ostwald says (p. 484):

"The idea of matter as the real substratum of all natural phenomena and as endowed with weight and mass, has arisen from the paramount influence of Newton's theory of gravitation to which at the end of the eighteenth century was added the law of the conservation of weight even in the case of chemical processes. Side by side with ponderable matter earlier science had quietly accepted imponderable matter as well, such as fire, electricity, etc. Even Lavoisier who was the first to point out clearly the remarkable significance of relations of weight in the determination of chemical processes, showed the influence of tradition by including heat and light in his table of chemical elements although he knew that they did not possess measurable weight. However, in the nineteenth century these antiquated notions disappeared completely, and the dualism of matter and force developed, in which upon matter devolved the function of substance in the Aristotelian sense, while the rôle of attribute (*Accidens*) was assigned to force. In this way matter became the only real thing in phenomena, and the imponderables, heat, light, and electricity attained thereby a peculiarly false position."

We are further told how Robert Mayer distinguished

between two things in nature: (1) matter of all kinds endowed with the qualities of ponderability and imponderability, and (2) forces (or as we now would say "forms of energy") which are imponderable. Mayer insists that force is as indestructible as matter although it is changeable and imponderable. According to Ostwald, Mayer follows a monistic tendency, but he is not thoroughgoing in the application of his principle. He stops half way, while modern energetics discards the dualism of matter and energy, and establishes energy as the one and sole reality. Professor Ostwald says (p. 488):

"Now it is characteristic of modern energetics that it sets aside even this dualism [of matter and energy] and installs energy as the sole universal generalization. All phenomena are reduced to properties and relations of energy, and especially matter, in so far as such a concept would at all prove useful, is to be defined in terms of energetics."

The law of the conservation of matter is denounced by Ostwald as an error because matter, says he (p. 486), "does not actually exist at all," for "only weight and mass are conserved while everything else pertaining to matter is changeable." This argument for the non-existence of matter is rather naive. Hitherto we have always thought that matter *is* weight and mass, and wherever we find weight and mass we have to deal with a reality called "matter." Now we are told that matter is unreal, that its qualities however are real. What would Professor Ostwald say to the retort that energy is a nonentity since there are only tensions and motions. We might in this way even deny the existence of motion, for what really happens is merely a change of place.

Ostwald goes far out of his way to prove that potential energy is real, which to our knowledge has never been doubted; but he further astonishes us by saying (p. 495) that "from the standpoint of a profounder and more gen-

eral contemplation of the concept of reality the distinction between actual and potential energy becomes an untenable and even dangerous error." Now we grant that potential energy is as real as kinetic energy; it is only latent because it is somehow pent up. It is the energy of tension which, however, can be set free in one way or another. Nevertheless we must distinguish between it, i. e., potential energy, and actual motion commonly called kinetic energy. The former can be changed into the latter and is energy as much and as truly as the latter; but for all that, potential energy is different from kinetic energy, being energy held in abeyance. Ostwald represents potential energy as more mysterious than it is, for leaving out complicated cases, what deep mystery is there in the tension of a bow? It is a strain; an incipient motion is prevented from moving. The string is drawn and held back, and when the tension is relaxed by releasing the string, the check is removed and the motion actually takes place. There is no need of any mystification nor of a refutation of a mysterious conception of the facts.

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Philosophy would be an easy job if it were nothing but a search for the most general term, but such is Ostwald's idea of it. He says (p. 497):

"What then is the task before us? We must find a concept which is applicable to the greatest possible range of phenomena and offers the greatest possible amount of definite information about each particular case."

It is an inveterate mistake to think that scientific problems are solved by generalization. Generalization is only reliable if guided by due discrimination, and between the two (in spite of Mr. Spencer's eulogies of "the power of generalization") discrimination is the more difficult and the more fruitful. A hasty generalization is exactly what we must be on our guard against. The mistakes of chil-

dren and of savages occur through wrong generalization by a lack of discrimination. How little Professor Ostwald is aware of the pitfalls of generalization, appears from the fact that he trustingly follows whithersoever generalization leads. He says (p. 488):

"The question why or for what purpose we should or must undertake this reversal of the significance of ideas, is answered by the fact that the concept of energy as a matter of experience is proved to be broader than that of matter. When this is once discerned all discussion will naturally cease. We can not define the concept 'man' by the concept 'negro,' but we can do the reverse."

It is true that we can not define the concept "negro" without the concept "man," but neither can we define it without enumerating those features which are typical of the negro and can not be traced in other species of the genus *homo*. The qualities common to all men are more obvious and more easily apprehended than those others which form the characteristics of the different species, and the latter are neither included in the former nor can they be deduced therefrom. The more general idea is by no means more useful for explanations than the more specific concepts, for we must not forget that the more general a concept is, the less does it contain, the poorer are its contents, and the emptier it is of detail. Any attempt at deducing all species from their common genus will soon prove a failure.

But the present situation is more complicated, because energy and matter are not homogeneous. Suppose we have the genus "man" and the idea "angel," can we subsume the latter under the former, because angels possess some features that are human? Scarcely! There is an element in the idea of angels which is not found in men.

We grant that gravity which is the most inalienable property of matter is, indeed, a species of energy, but for that reason we do not feel justified in eliminating the term

matter. Energy, even according to Professor Ostwald, is imponderable, and yet ponderable matter is assumed to be energy. Energy is not extended, for it is not material nor a bodily reality, yet we are expected to seek in energy the key to the riddles of both space and substance. Professor Ostwald does not betray the secret of his solution, nor can he, for the term "energy" is not the genus of either space or substance. It is the most general term of its kind but it does not possess that universality which he imputes to it.

Ostwald speaks of "volume-energy" but nothing is gained by the introduction of this compound word. We know what volume is and we know what energy is, but it would be easier to explain the nature of a fish from a mermaid than the character of volume, of space, or of extension, from volume-energy.

* * *

Efforts have been made before Professor Ostwald to find a common term for both matter and energy, but all attempts have failed and must fail, although we grant that matter according to its mass possesses a definite amount of energy called gravity which changes with a change of position. We had a discussion on the subject more than thirteen years ago with Mr. Paul R. Shipman whose theory on the identity of matter and energy is, if possible, even more ingenious than Professor Ostwald's, but it is no less faulty in its logic. Mr. Shipman's mistake is ultimately the same as Ostwald's, a misapplication of the monistic principle combined with a wrong method of generalization.

It will help us to understand the mistake of Ostwald, if we become acquainted with his American counterpart and hence it will not be too great a digression if we quote some striking passages from Mr. Shipman's article "Suggestions Touching Matter and Energy," which appeared in No. 349 of *The Open Court* (May, 1894, pp. 4063 ff.) There he says:

"Speaking roundly, as well as figuratively, we may call matter funded energy—energy current matter; or matter we may distinguish, roundly, as visible energy—energy as invisible matter. Take, for example, the clod at your feet. It is matter, you say; yet analyse it, pushing the analysis as far as you may, and you get nothing but modes of energy, with a residuum that offers nothing different. Nevertheless, these parts together make the clod. Whither does this unquestioned fact point, if not to the conclusion that matter and energy are in essence the same? Nothing but energy can be got out of matter, because matter is nothing but energy more or less compounded, as energy is nothing but matter more or less resolved. Matter, one may say, bears the relation to energy, always speaking roundly, that a stocking bears to the thread of which it is knit: ravel matter, and you have energy—knit up the raveling, and you have matter again. Energy is the simpler state of the common substance—the raw material, as it were, of which matter is the elaboration in greater or less degree....

"The insensible is conceivable only in terms of the sensible, into which, if real, it is transformable. Cognition of the insensible supposes cognition of the sensible, conception being possible only within the limits of possible perception. Let this truth be firmly grasped. The intellectual currency that is not redeemable in the standard coin of the realm of sense is worthless. What cannot be translated into resistance has no existence, no reality, no meaning, is nothing. Whatever resists exists, and, conversely, whatever exists resists. Resistance and existence are interchangeable terms; but resistance is synonymous with energy or force, which is the stuff of sensible matter—that of which sensible matter is the more or less complex form. For existence, be it observed, though fundamentally one, is divisible superficially into ponderable matter, or matter so named, and imponderable matter, or energy, whereof each is tranmutable into the other, the two mutually blending to form the sum-total of reality."

Mr. Shipman's article is noteworthy on account of the ingenious way in which he renders his identification of matter and energy plausible to the reader, but there is no need of subsuming everything under one head. Among other things we said in our reply:

"When we make the abstraction 'matter,' we select certain fea-

tures of our experiences, and drop all others. When speaking of the matter of which a man is composed, we advisedly omit his feelings, his intelligence, his character, his plans, and purposes, and so forth. When speaking of motion, we mean change of place, and not mass, not matter, not spirit, nor anything else; when speaking of force, we refer to that which can produce motion and overcome resistance.

"This seems clear enough, and yet how much is this elementary rule of thinking sinned against! There are plenty of pseudo-monistic philosophers who are perfectly satisfied as soon as they have stored all their ideas into one box of their favorite generalization. Whenever they try to think their ideas to an end they become entangled in contradictions, and seeing no way out of it, they naturally turn agnostics....

"To-day Mr. Shipman presents us with a number of conundrums which grow out of the henistic principle of his method. We are told that 'matter and energy are in essence the same.' 'Force is material,' yet at the same time 'matter is immaterial.' This being so, the old refrain follows: 'Existence is an inscrutable fact.'

"That any one could regard 'change of place' as a material thing seems impossible, but such is the consistent sequence of Mr. Shipman's materialistic henism.

"There are a number of minor points in Mr. Shipman's article; e. g., 'energy is something moving,' while it is the actual or potential moving of something; matter and energy are 'transmutable each into the other,' which is a new law that if true would produce changes more wonderful than Aladdin's lamp; 'energy is a form of matter, and is its own vehicle'; which sounds like, 'a blow is the fist which deals the blow, and a blow is its own striker'; 'no atom moves without loss of substance,' an observation which, for all we know, might prove true, but where is the verification of this startling proposition? Shall we believe that the ether profits thereby and is thus constantly increasing, or is this loss of substance an absolute loss so that in the long run the world would dwindle away? 'What cannot be translated into resistance has no existence.' Can we translate the theorem of Pythagoras into resistance, or the ideas of truth, beauty, and righteousness? And as we cannot, have they, therefore, no existence?"

We have to grant that matter contains besides its gravity (i. e., the weight which matter exerts and which can

be expressed in terms of energy) the additional feature of volume which can not be described in terms of energy; and further, while all other forms of energy are transferable from one body to another, gravity is always inalienably joined to a definite mass. These considerations are sufficient to continue the discrimination made between matter and energy. Even if Mr. Shipman's contention be granted that we know matter only in terms of the energy which it exerts, we must confess that there is a residuum, and this residuum of matter is the substance of or from which matter is formed.

The difficulty of the concept matter lies in the fact that it is not yet an ultimate generalization like energy and form, for it is not a simple but a complex idea. Matter is commonly defined as volume and mass, and so it is extended in some shape or other (i.e., it has form), and is possessed of energy. It is quite justifiable to look upon the energy exercised by the weight of a gravitating body as essentially the same as other energies; for the falling stone, the gushing water of cataracts, the pressure of a weight in a clock, etc., can do work as well as the heat of burning coal and electricity. On this point we agree with Ostwald. There is only this peculiarity that gravity is inseparable from mass. Its energy is localized and it can not be absolutely detached from the body to which it belongs except in portions by a change of position. When raising a stone we add to it a certain amount of energy which is given out again when it falls. The mass itself, however, remains the same and we have not yet succeeded in resolving any portion of mass into pure energy. Mass constitutes a kind of substratum which remains, and on its account, naturalists are justified in retaining the word "matter."

We deem it quite probable that matter has originated from ether, and that ether is the simplest form of existence.

We assume that ether is the stuff the material world is made of and that it has been changed into matter by condensation. In other words: energy somehow seizes upon ether and creates within it a rotation causing in the ocean of its originally homogeneous mass, innumerable little whirls, which with their swift currents produce among themselves the tension of gravity. Thus gravity may be the work of energy, and matter its product; but in that case we would mean by matter a certain energized form of the ether, and we would still retain the notion of a substratum, a quantity of something, a substance, a material.

Thus a final analysis of all material things would lead us to the assumption of a world-substance (which, from our present knowledge, appears to be the ether) as an ultimate substratum of all existence, itself imponderable and not possessing the properties commonly attributed to matter; but when condensed into whirls the ether acquires a tension decreasing with the distance in all directions, and creating a mutual attraction between any two sets of such whirls, which from *a priori* mathematical considerations should be directly proportionate to the product of both amounts of energy needed for their contraction and inversely to the squares of the distance between their centers,—and this would be the Newtonian formula for gravitation.

The problem of the origin and final dissolution of gross matter is not yet sufficiently matured for discussion, but the theory has lately been rendered more probable by the experiments of Ramsay, which promise to amplify our knowledge of matter, but even if the idea of the eternity of matter will have to be surrendered, we see as yet no chance for disposing of the word “matter,” still less for disproving the existence of its reality. Evidence of the instability of matter will only modify the law of the conservation of matter into the wider generalization of the

conservation of substance. It is the idea of substance which we can not get rid of, and to be fair to the formulators of the law of the conservation of matter we must grant that they meant the conservation of substance. They simply meant to deny a creation from nothing; and we would say that all creation consists in a formation, or in other words, all processes are transformations.

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In reducing all things, even the soul, to energy, Ostwald follows the principle of his great teacher Ernst Mach, who in one of his masterly expositions on the nature of cognition points out that the method of comprehending the unknown consists in defining it in terms of the known with which we are familiar. This is quite true if the known and the unfamiliar (i. e., the not understood) are homogeneous, but not if they are heterogeneous.

We accept Mach's principle as the quintessence of monism which consists in a unification of facts. But here is the salient point of difference between our conception of monism and the current interpretation of it, as we have pointed out on several occasions. We define monism as a unitary conception of the world. The cosmos is a great whole dominated by one principle that is consistent with itself. There are different aspects of it, as there are different conditions, and these different aspects are formulated by scientists as natural laws so called, but all natural laws are only one and the same law in different applications. The world is full of contrasts, but the constitution of the world, the entire system of its laws possesses no contradictions. Wherever we meet with a contradiction, it is apparent only and we are confronted with a problem. The problem is solved as soon as the contradiction has been overcome and a monistic interpretation found.

A unitary conception of the world is a demand of our

mind which, like the mariners' compass, has guided us in our search for truth, and it has heretofore proved true. We have good reason to believe that its reliability is well founded in the nature of things, which means that it not only possesses a subjective significance, but that it is ultimately rooted in the constitution of objective reality.

In contrast to our monism as a unitary conception of the world, there are other monisms which seek the unity of the world, not in the unity of truth, but in the oneness of a logical subsumption of ideas. Monists of this type produce systems whose unity is artificial, purely external and sometimes palpably erroneous, wherefore we designate their views as pseudo-monism.

Professor Ostwald, for instance, is satisfied to build his philosophy upon the concept of energy as its cornerstone, merely because he thinks it is the widest generalization possible; and there are other monists who select other generalizations, such as matter or spirit, as their foundation. This is not establishing a unitary view which preserves the contrasts that actually exist, and only removes the contradictions. This is twisting the facts into the philosophy of a single idea; it is henism,* not true monism. In other words, henism is the establishment of an external and indeed a wrong unity which does not do justice to the contrasts that actually exist, while true monism is a unitary conception which does not deny but explains the contrasts and shows them to be factors in one consistent system of truths.

It is characteristic of henistic thinkers to denounce all general concepts as mere abstractions with the exception of

* Henism is derived from the Greek *εἰς*, *εἰρός*.

We have repeatedly had occasion to call attention to henistic theories which go by the name of monism. See, e. g., our discussion of Professor Haeckel's monism in *The Monist*, Vol. II, p. 498, and especially in *The Open Court*, Vol. VII, p. 3528. Compare also *The Monist*, IV, No. 2, p. 228 and a brief review of "Haeckel's Theses for a Monistic Alliance" in *The Monist*, Vol. XVI, p. 120 f. It is natural that pseudo-monists look upon a true monism as dualistic, since it recognizes the existence of contrasts.

their fundamental notion, be it spirit, or matter, or energy, or God, or anything else. So to Hegel the most real thing is the absolute, to Schopenhauer it is the will, and to Ostwald, energy. We notice his complaint that the word energy may mean at the same time both the abstract notion and the concrete reality. Like all henists he overlooks the fact that the same is true of all abstractions. All generalizations are abstractions, and we insist that all abstractions denote realities,—if not real things, yet certainly real qualities, or something that is actually present in one way or another in different things. Abstractions are empty or unreal only to those who are incapable of thinking in abstract terms. To the trained thinker all general ideas have been deduced from experience and possess therefore a real value, they denote actualities.

It is characteristic of all pseudo-monistic theories (perhaps of most philosophies that go astray) to overlook the significance of form, which is *the most important of all abstractions*. We have insisted on this truth so much that we might characterize our own philosophy as the philosophy of form. Instead of trying to unify matter and energy, we insist that the oneness of the world is based upon the systematic unity of form—popularly speaking of the universality, the intrinsic necessity, and harmony of the laws of form. We are confronted with uniformities which are formulated as natural laws, and all uniformities constitute one great consistent system. Moreover, the whole of reality forms one inseparable unity of which all things are parts. No single thing can be taken out and be set aside as a thing in itself. There are no things in themselves. Everything is what it is only as a part of the whole, and this is true of all our abstractions. We classify our abstractions into hierarchies of genera and species, which procedure is possible in the world of objective existences only because there are uniformities, and we find that laws

of form dominate all changes and govern the formation of all beings.

Here appears the importance of the abstraction of form together with all the sciences of pure form, logic, mathematics, the algebra of thought, arithmetic, etc., which is the field of Kant's *a priori*, an idea which is now commonly but erroneously discredited, for all science, in fact every rational argument, is based upon purely formal thought which in its very nature is *a priori*.*

Our analysis of the objective world yields three abstractions which, each in its own way, are the widest generalizations; they are substance, energy and form, but form is the most important among them.

Man has become a rational being by his formal thought. The speaking animal develops reason, and human reason in contrast to the thinking faculty of brute creatures is distinguished by the ability of abstraction, i. e., by denoting in word-symbols the uniformities of nature. Formal thought (logic, arithmetic, mathematics) is always the backbone of abstract reasoning. A cat may miss one of the number of her kittens, but she can not count them. To think in abstract terms, to classify things as genera and species, to count and in general to formulate the uniformities of experience, to utilize this knowledge for the purpose of mastering his surroundings, is the privilege of man.

It is noteworthy on the one hand that all formal concepts such as number, geometrical figures, logical relations, etc., can be constructed without reference to actual things, by purely mental processes; and as such they exhibit methodical systems in which all relations are intrinsically necessary, or, as it has also been expressed, we arrive at conclusions which are uniquely determined. On the other hand we find that these purely mental constructions furnish

* Cf. on the subject the author's *Fundamental Problems, Primer of Philosophy*, and *Kant's Prolegomena*.

the frame work of our comprehension of nature, for the main laws of nature are identical with the highest generalizations of reason. This is Kant's problem, so splendidly treated in his *Prolegomena*.

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We emphasize the significance of form and with it of formal thought, because the lack of its recognition must have been the cause of Professor Ostwald's anxiety to seek the solution of all problems in energy. All problems are problems of form. The terms "matter" (or better "substance") and "energy" are simply two denotations of existence, the former of reality (or thingishness) the latter of actuality, (i. e., the effectiveness of all actions or transformations); and the two ideas of actuality and reality are so closely interrelated as to render the words almost interchangeable. According to Ostwald it is sufficient that existence is actual, it need not be considered as real, but neither the actual nor the real can exist without the other. Yet by discarding either of the two we are very little helped because both terms denote the ultimate facts of the manifestation of existence. The terms matter and energy explain nothing and can explain nothing, for explanations are always the comprehension of a transformation. The terms matter and energy only denote that the objects under consideration are real and that the events are actual.

If energetics provided the correct solution, we would after all have to trace the different forms of energy, and if materialism were right, we would have to trace the forms of matter, and so matter as well as energy would in either case remain unanalysable ultimates, one denoting the reality of existence, the other the actuality of all changes. Wherever we turn we find that these notions of actuality (i. e., energy) and of reality (i. e., substantiality) explain nothing; they merely denote that we deal with objective

facts. Explanations are always due to a tracing of the formal aspect of phenomena.

Ostwald expects that from the standpoint of energetics all the sciences have to be recast, not only physics and chemistry but also history and economics, yea psychology too. The progress of civilization, e. g., should be regarded merely as "a transformation of energy." The quantity of energy, Ostwald claims, is not indifferent even in that sphere of nature which is void of valuation, but it counts also for man, only the situation is complicated, and "an amount of energy is, in general, the more valuable, the more completely it may be transformed for man's purposes" (p.513). He says that the reason why certain things with less energy, e. g., food-stuffs, are worth more than, e. g., coal is due to the mutability of the former, but it will be difficult to explain from Ostwald's theory how a diamond which contains little energy and is possessed of no great mutability can fetch so high a price.

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What Professor Ostwald says of pseudo-problems is not to the point, and we can pass it over in silence, while his distinction between hypotheses and prototheses is not helpful. According to him the soul is a peculiar kind of energy, and this assertion would have to be regarded as a protothesis, (i. e., a preliminary thesis) not a mere hypothesis (i. e., an assertion that can neither be proved nor disproved because it deals with fictitious assumptions.) And the test for its being a protothesis consists in this that we can substitute for the term soul a value of energy, —as if an idea became true by being defined in terms of a measurable quantity of energy!

* * *

The duty of the scientist, and also of the philosopher among scientists, is not to subsume all generalizations

under one common head, but to construct a thought-picture of the world or of any special phenomenon which happens to be under consideration in well-defined terms for the purpose of describing it with accuracy in all its essential features. Mach calls it "*ein Nachbilden der Thatsachen.*" This thought-picture should appropriately represent its analogous reality in such a way as to show thereby how things originate and how events take place through definitely determined transformations. We are very little helped by materialism when we are told that everything is matter, that bodies are matter, and that thoughts are merely a function of matter, and Professor Ostwald's energetics is not a whit better when it tells us that matter is energy, and that the soul too is only a factor of energy. This is no explanation of the nature of the soul; on the contrary it obscures the problem and introduces a misunderstanding of the work previously done by our predecessors.

Professor Ostwald rejects the theory of parallelism in psychology, and he refers to Leibnitz who insisted upon the difference between mechanical processes and consciousness, claiming that consciousness is not motion, and motion can never be turned into consciousness. We doubt whether Professor Ostwald ever gave a close attention to the problem which Leibnitz had under consideration, for if he had done so, he would never have propounded his solution that the soul is energy. He concedes to Leibnitz that psychic states shall not be regarded as matter in motion, but he sees no absurdity in their being a kind of energy.

He says in his *Vorlesungen über Naturphilosophie*, p. 396:

"I know no more convincing proof of the philosophical value of the world-conception of energetics than the fact that in its light this old problem loses all of its terrors. The difficulty arises simply from the assumption of Leibnitz, as well as Dubois-Reymond and

Descartes, that the physical world consists of nothing but matter in motion; of course in such a world, thought can have no place. In looking upon energy as the final reality we perceive no such impossibilities. We have seen in the first place that manifestations of nerve-control may be referred to processes of energy without contradiction, and we have seen that nerve-processes which are accompanied by consciousness are constantly combined with unconscious processes. I have taken the greatest pains to find any absurdity or unthinkableness in the supposition that consciousness is determined by definite kinds of energy. I have not been able to discover anything of the sort. As soon as we investigate the most important phenomena of consciousness we become at once convinced that they are dependent on energy, and to my mind it is no more difficult to think that motion is dependent on kinetic energy than that consciousness is dependent on the central nervous system."

Leibnitz's criticism of the mechanistic theory with which Professor Ostwald has become acquainted through Dubois-Reymond, hits Ostwald's energetics just as severely as any materialistic philosophy, and when Ostwald declares that he does not feel it, it only proves that he does not understand Leibnitz's argument.

If we bear in mind that the abstractions we make should denote exactly the value of the features which they describe, nothing more, nothing less, we must grant that motion means motion, not thought, not consciousness, not sensations. Accordingly we can not deduce from the abstract idea of motion anything that remotely resembles psychic activities. The soul with all that is implied thereby belongs to another set of generalizations. All the mechanical events in the world constitute a complete mechanical system, being all kinds of forms of motions and tensions which are transformed into one another. Nowhere can there be a gap, and all changes of place must be due to a push or a pull, never to a feeling, nor a thought, nor a state of consciousness, and *vice versa*, neither motions nor tensions can produce consciousness.

We will quote the passage in question. Leibnitz says:

"If we could imagine a machine the operation of which would manufacture thoughts, feelings, and perceptions, and could think of it as enlarged in all its proportions, so that we could go into it as into a mill, even then we would find in it nothing but particles jostling each other, and never anything by which perception could be explained."

The brain is such a machine. It manufactures thoughts, feelings, and perceptions. Now then, if we assume that the brain could be so enlarged in all its proportions that we could enter into it as into a mill and watch its operations we would see motions and tensions, states of kinetic and potential energy, pressures and counter-pressures, and their apparently insignificant motions setting free the pressures and changing states of apparent inactivity into work, but we would see no feelings, no sensations, no consciousness. And why not? Simply because feelings, sensations, and consciousness can not be seen; they can never be objects of sensation; they can not be touched by the hand or observed by any one of our senses. And why can they not be objects of sensations? Simply because they are not objects; they are subjective states.

Feelings can only be felt and it is obvious that we can feel our own feelings only, not the feelings of others. But while we could never see the feelings, nor sense them in any way, even if we could enter the workshop of the brain and watch the mechanism of consciousness in all its wonderful details, we could see some movements of this thought-machine which we would have reason to assume to be accompanied by feelings. The mechanism of the brain is complete. It is pull and push that produces motion, and there is no gap in the chain of mechanical events. Such is the nature of the objective world, of the Not-me, of things observable. We find there only transformations, only changes of matter in motion. If we knew nothing about existence but the data of our experience, if we did

not know ourselves, or if by some trick we could be prevented from becoming aware of our own existence as conscious beings, we would not know that there are such things as perception, sensation, feeling, sentiment, thought. We know of their existence only through self-observation, through the immediate fact of our own feelings. We have no direct knowledge of the feelings of others; we only assume that other bodies organized in the same way as we and behaving like ourselves under analogous circumstances have analogous feelings.

These considerations are the basis of the theory of parallelism which since the days of Leibnitz has been accepted by such psychologists as Herbart, Weber, Fechner, Wundt, Hering and others, and which is not a dualism, but true monism. For it must be understood that the recognition of a duality and pointing out of contrasts does not mean that there are two heterogeneous things, and that reality is a composition of two incompatibles. It simply means that existence is not a rigid unit, but a process, a state of action and reaction, which is necessarily polarized into contrasts. The inner condition and the outer manifestation are one reality. There are not subjective states which are nothing but psychic, and there are not objective realities which are nothing but forms of matter in motion. The term "parallel" refers to our abstractions, not to the realities themselves. In reality subject and object are one; subject is an existence as it appears to itself if viewed from within itself, and object, as viewed from the outside. I feel myself to be a sentient being, but to others I appear as a body of definite shape, moving about in space.

Though materialism and energetics are exactly in the same predicament, Professor Ostwald regards the former as untenable, the latter as well founded. The truth is that he keeps one measure for materialism and another for his

pet theory, energetics. He says in his *Vorlesungen über Naturphilosophie*, p. 397:

"If we know from experience that man's spirit is associated with the 'matter' of his brain, there is no reason why spirit should not be connected with all other matter. For the elements carbon, hydrogen, oxygen, nitrogen and phosphorus in the brain are no different from the same elements as they occur everywhere else on the earth; because of the transformation of matter they are constantly replaced by others whose origin is quite different as far as their action within the brain is concerned. Therefore if spirit is a property or effect of matter in the brain, then according to the law of the conservation of matter, it must, under all circumstances, be a property of the atoms assumed by the mechanistic theory, and stones, tables, and cigars must have souls as well as trees, animals and men. In fact, granting the assumption, this thought obtrudes itself so irresistibly that in later philosophical literature it is either recommended as correct (or at least as reasonable), or else a decided and insurmountable dualism between spirit and matter is erected in order to evade it."

This argument is as unfair as it is superficial, and it applies with equal force to energetics. There are as many different kinds of matter as there are different forms of energy. While the elements remain oxygen, hydrogen, carbon, etc., their combinations exhibit new qualities which do not exist in their separate states and originate through the new formations into which they are joined. In the same way motion is change of place, but the motion may be molecular such as heat, or molar such as the movement of mass, or pressure such as potential energy, etc. Ostwald's argument that if the action of brain matter is associated with consciousness we ought to attribute the same quality to the burning cigar, proves a boomerang in his hand, for what is true of matter in motion is true also of energy. It is astonishing that Professor Ostwald does not feel how hard he hits himself. He continues (*ibid.*, p. 397):

"Even this difficulty takes flight before energetics. While

matter follows the law of the conservation of the elements so that the amount of oxygen, nitrogen, etc., present in a limited space in a combined or uncombined condition can not be changed by any known process, yet in general it is possible for a given amount of energy to be converted into another without leaving a measurable residue of the first. Experience therefore in no way contradicts the idea that particular kinds of energy require particular conditions in order to originate, and that whatever amounts of energy are present can also disappear again altogether by means of conversion into other forms. This is the case with spiritual energy, that is, with unconscious and conscious nerve-energy."

No fond mother can be more blind to the faults of her own child while chiding the children of other people than is Ostwald with the child of his own nerve energy. We must abstain here from pointing out on the one hand how little we are helped by Professor Ostwald's declaration that everything is energy, and on the other hand how unsatisfactory his several solutions are, e. g., his theory of pleasure and pain, his conception of art, his definitions of good and bad,* etc., we will limit our further comments to a brief explanation of the problem which Professor Ostwald has failed to understand.

Our conception of energy denotes energy, nothing more, nothing less. We mean by it that particular feature of our experience which all forms of energy possess in common. Under the general concept of energy we subsume all the various kinds of energy, potential as well as kinetic, and we observe that one form of energy frequently changes into other forms and that without increasing knowledge we can guide these changes at will. Heat, light, electricity have been discovered to be forms of energy, i. e., they have been proved to be forms of motion and it is by no means impossible that there are forms of energy still unknown to us. But one thing is sure that however wonderful the different known and unknown forms of energy are or may

* These subjects are discussed by Professor Ostwald in his *Vorlesungen*, and we refer the reader especially to pp. 388 ff., 433 ff. and 450.

be, energy will always remain energy (a motion or a tension) and will never be something which is not energy. Feeling may be conditioned by a state of nervous commotion in the brain, but feeling is not energy; neither its nature nor its origin can be explained from the idea of energy. But while feeling is not energy, it may be associated with it as an accompaniment that appears under definite conditions.

We must remember that energy is an abstraction. It does not denote the whole of the world but only one definite feature of our experience. When the general terms in which we describe the objective world do not contain concepts under which the characteristic feature of consciousness can be subsumed, we must conclude that the objective world is not the whole of existence, but that there is a subjective side to it which for a description needs terms of its own.

We are compelled by the logic of our argument to assume that all objects, even those that are lifeless, are possessed of a subjective interior, but we will readily grant that the appearance of feeling depends upon organization. Stones may possess potential feeling, but we would refuse to say that they perceive the impression made upon them. There is no need of assuming that the burning cigar suffers pain. Things that have no organs of perception can not be regarded as sentient. In plants we can notice mere irritability but not sentiency in the sense that we possess it. Actual sentiency develops in an organ that stores up feelings in the form of memories, being thus enabled to note the impressions made upon it, to compare them to, to contrast them with, or subsume them under the memories of prior analogous impressions and so become aware of its feelings. If there are feelings in the unorganized portion of objective nature we can understand that they must be absolutely latent, because they are isolated. Feelings must

be felt in order to be actual feelings, and so even on the supposition that all objective existence is potentially subjective, we must grant that in inorganic nature there can not be any consciousness.

It can not be our plan here to offer a full exposition of all the problems which, in our conception, Professor Ostwald has failed to solve. We merely deem it our duty to point out his errors, and the way to their correct solution.

We have on other occasions (especially in *The Soul of Man* and in *Whence and Whither*) set forth our own view of the nature of the soul, the rise and significance of consciousness, the origin of mind, and kindred problems treated from the standpoint of the philosophy of science. It is very desirable that men of science turn to philosophy, and we recognize the good intentions of Professor Ostwald. Considering his high standing and his general proficiency which we fully appreciate, we regret to find him not sufficiently equipped for the philosophical task he has set himself. In spite of his merits in his own line of physical chemistry, his wide range of knowledge, his conspicuous success as an academic lecturer, and his many meritorious works on science, we must say that his methods are mistaken, his main conclusions untenable and his philosophy deficient.

If our exposition of the problems under discussion can be proved wrong we are ready for correction, but if it be of any assistance to Professor Ostwald and to other scientists who like him try to build up a philosophy of science, we would deem our labors gloriously rewarded and the main purpose of our philosophical work crowned with success.

EDITOR.